

Chapter 12 Quantities, Costs & Specifications

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12.1 Quantities - General

The quantities of the various materials and work items involved in the construction of a project that includes bridges and structures are needed for establishing the estimated cost of the project throughout the design process, and for establishing a basis for comparison of the contractor's bids.

12.1.1 Cost Estimating Quantities

Quantities for establishing cost estimates are often necessary during various stages of project development and are required at the completion of the Bridge PS&E. These quantities should be calculated from the best information available at the time (see BDM Section 12.2.3).

The policy regarding the preparation of quantity calculations is as follows:

A. Conceptual Stage

During the conceptual stage of a project, estimated quantities may be required to arrive at an estimated cost. The need for conceptual stage quantities will be determined by the Bridge Projects Unit.

B. Preliminary Plan Stage

Upon completion of the preliminary plan, estimated quantities may be required to arrive at an estimated cost. The need for preliminary plan stage quantities will be determined by the Bridge Projects Unit.

C. Design Stage

If requested, quantity calculations shall be made, reviewed, and submitted to the Bridge Projects Unit by the Bridge Design Unit as the design progresses. The first submittal of estimated quantities shall be made as soon as the major dimensions of the structure are determined. As refinements in the design are made, quantities varying more than 10 percent from those previously submitted shall be resubmitted.

D. Final Contract Quantities

Upon completion of structural design and plans, the quantities of materials and work items involved in the construction of the project shall be computed. See BDM Sections 12.2.2 and 12.2.4 B.

12.1.2 Not Included in Bridge Quantities List

Items of work which appear in the bridge plan sheets, but for which details, specifications, and quantities are not included in the Bridge PS&E, shall be listed in the "Not Included in Bridge Quantities List" (Form 230-038 and Figure 12-A-1). This list is required for every bridge, even if no items of work are shown in the Plans that are in this category. (In this case, fill out the bridge information at the top of the form and write "NONE" across the form.) This form is transmitted to the Region Design PE Office with all Preliminary Plan submittals, all Bridge PS&E distributions, and at various milestone points during the design process, to ensure that the responsibility for all PS&E items is clear. Particular care shall be taken in the preparation of this list as omissions can result in an incomplete project PS&E with missing information for work items, or conflicting overlapping information for work items.

12.2 Computation of Quantities

12.2.1 Responsibilities

A. Design Unit

The Design Unit is responsible for calculating quantities required for cost estimates for Preliminary Plans prepared in Design Units, calculating preliminary quantities at various milestones during the design process, and calculating quantities for the final Bridge PS&E. The Design Unit is responsible for notifying the Region Design PE Office and the Bridge Projects Unit whenever structural design changes and alterations are made to the design features and quantities which affect the cost of the structure, especially following the distribution of the initial Preliminary Plan.

B. Bridge Projects Unit

The Bridge Projects Unit is responsible for computing quantities for conceptual stage cost estimates, and cost estimates for Preliminary Plans prepared in the Bridge Projects Unit. The Bridge Projects Unit is responsible for ensuring that the quantities listed in the AD Copy Bid Proposal correspond to those received from the Design Unit.

12.2.2 Procedure for Computation

Quantities are to be computed and checked independently. The designer/originator and checker shall separately summarize their calculated quantities on the "Bridge Quantities" Form 230-031 (See Figure 12-A-2) in the units shown thereon. The two summaries shall be submitted to the Design Unit Supervisor for comparison. The designer/originator and checker shall use identical breakdowns for each quantity. For example, the designer/originator's quantities for excavation for each of Piers 1, 2, and 3 should be compared separately against the corresponding quantities made by the checker.

When the desired accuracy is achieved, a Supervisor's Bridge Quantities form shall be prepared and submitted to the Bridge Projects Unit along with the 90 percent Bridge Plans submittal. (This form is the same as previously mentioned except that it is labeled "Supervisor's Bridge Quantities" and is completed by the unit supervisor or designee. If the unit supervisor elects, the designer/originator's or the checker's Bridge Quantities form may be designated as "Supervisor's Bridge Quantities.") This form is used by the Bridge Projects Unit to prepare the final bridge cost estimate.

All quantity calculations and bridge quantities forms are to be filed in the job file for the structure or the PS&E file for the project. All subsequent revisions shall be handled in the same manner as the original quantities. On the "Bridge Quantities" form, any revision to the original figure should not be erased but crossed out and replaced by the new figure using a different colored pencil. If there are too many revisions, the old summary sheet should be marked void, left in the file, and a new sheet made out, marked "Revised," dated, and the original forwarded to the Bridge Projects Unit.

Mistakes in quantities can be very costly to Contracting Agency. The designer/originator and checker must account for all items of work on the "Bridge Quantities" form, and must also be careful to enter an item of work only once (e.g., concrete or steel rebar in the superstructure should not be entered both in the lump sum superstructure breakdown and in the unit bid item quantity).

12.2.3 Data Source

Quantities of materials for use in preliminary cost estimates can often be obtained from the quantities calculated for previous similar designs. This information is available from the Bridge Projects Unit.

12.2.4 Accuracy

A. Preliminary Quantities

Quantities used for cost estimates prepared during the conceptual stage of the design are expected to have an accuracy of ± 10 percent. The first iteration of quantities, after the preliminary plan has been completed, is expected to have an accuracy of ± 5 percent.

B. Final Quantities

Final quantities in the Bridge PS&E submittal, including bar list quantities, to be listed in the Special Provisions and Bid Proposal sheet of the AD Copy, are to be calculated to have an accuracy of ± 1 percent.

12.2.5 Excavation

A. Structure Excavation, Class A

Excavation necessary for the construction of bridge piers and reinforced concrete retaining walls is classified as Structure Excavation, Class A (see the definition as specified in Standard Specification Section 2-09.3(2)). Payment for such excavation is generally by volume measurement. The quantity of excavation to be paid for is measured as specified in Standard Specification Section 2-09.4, and computation of this quantity shall conform to these specifications. If the construction circumstances for the project require structure excavation limits that do not conform to the Standard Specification definition, then the modified structure excavation limits shall be shown in details in the Plans.

Structure excavation for footings and seals shall be computed using a horizontal limit of 1 foot 0 inches outside and parallel to the neat lines of the footing or seal or as shown in the Plans. The upper limit shall be the ground surface or stream bed as it exists at the time the excavation is started. See Figure 12-1(A), (B), and (C).

Figure 12-1

Structure excavation for the construction of wing walls shall be computed using limits shown in Figure 12-2.

Figure 12-2

Figure 12-3

When bridge approach fills are to be constructed in the same contract as the bridge, and the foundation conditions do not require full height fills to be placed prior to the construction of the pier, the approach fill is constructed in two stages, i.e., constructed up to the bottom of footing or 1 foot above the bottom of footing, and then completed after the bridge construction. (The Materials Laboratory Geotechnical Services Branch shall be consulted on the staging method.) The structure excavation shall be computed from the top of the first stage fill.

The bottom of a spread footing will be placed 1 foot 0 inches below the top of the first stage fill. See Figure 12-4(A). The bottom of footings supported on piling will be placed at the top of the first stage fill; therefore no structure excavation is required (see Figure 12-4(B)).

The limits for stage fills shall be shown in the Plans with the structure excavation, if any.

Figure 12-4

Prior to pier construction, when (1) a full height fill with or without surcharge is required for settlement, or (2) the original ground line is above the finish grade line, the upper limit of structure excavation shall be computed to 1 foot 0 inches below the finish grade (pavement) line (see Figure 12-5).

Figure 12-5

B. Special Excavation

The excavation necessary for placement of riprap around bridge piers is called Special Excavation (see Figure 12-6).

Special excavation shall be computed from the top of the seal to the existing stream bed or ground line along the slopes indicated in the Plans. Special excavation will only include excavation outside the limits of structure excavation.

The limits for special excavation shall be shown in the Plans.

Figure 12-6

C. Shaft Excavation

Excavation necessary for the construction of shaft foundations is measured by volume and paid for at the unit contract price per cubic yard or cubic meter for "Soil Excavation For Shaft Including Haul."

The usual limits for computing shaft excavation shall be the neat lines of the shaft diameter as shown in the Plans, the bottom elevation of the shaft as shown in the Plans, and the top of the ground surface, defined as the highest existing ground point as shown in the Plans within the shaft diameter.

The methods of measurement and payment and the limits for shaft excavation shall be specified in the Special Provisions.

12.2.6 Shoring or Extra Excavation, Class A

Shoring, cofferdams or caissons, or extra excavation required for construction of bridge footings and reinforced concrete retaining walls constructed in the wet or dry is classified as Shoring or Extra Excavation, Class A. See Standard Specification Section 2-09.3(3).

Structural shoring (for dry excavation) or cofferdams (for wet excavation) is required for all excavations near completed structures (foundations of bridges, walls, or buildings), near underground utilities, near railroad tracks, and near pavement. All other excavation four feet or more in depth shall be either shored with structural shoring or cofferdams, or shall meet the open-pit excavation requirements as specified in Standard Specification Section 2-09.3(3)B.

For the purpose of estimating the cost for shoring or extra excavation, Class A, it is necessary to compute the peripheral area of an assumed sheet pile enclosure of the excavated area.

While payment for Shoring or Extra Excavation, Class A, is made at a lump sum contract price, the costs are a function of the overall height of excavation. In general, each side of the excavation for each pier shall be categorized into an average overall height range as shown on Form 230-031 (i.e., less than 6 feet, 6 to 10 feet, 10 to 20 feet, or greater than 20 feet), the area for the side computed using the appropriate width times the average overall height, the overall area for the side shall be entered in the category that matches the side's average overall height. These calculations are required for each pier of the bridge as applicable. See accompanying Figure 12-7 and sample calculation.

For excavation in the dry, the peripheral area shall be the perimeter of the horizontal limits of structure excavation times the height from the bottom of the footing to the ground surface at the time of excavation.

For excavation in water, the peripheral area shall be the perimeter of the horizontal limits of structure excavation times the height from the bottom of the seal to 2 feet above the seal vent elevation.

For shaft-type excavations, it is not normally necessary to compute the area for shoring because the shoring is usually accommodated by the work items for permanent casing, temporary casing, and casing shoring.

Figure 12-7

Sample Calculation:

For this pier (Figure 12-7):

Side A: average height = $(4 + 6)/2 = 5$ feet
width = 15 feet
area = $5 \times 15 = 75$ square feet

Side B: average height = $(6 + 15)/2 = 10.5$ feet
width = 20 feet
area = $10.5 \times 20 = 210$ square feet

Side C: average height = $(10 + 15)/2 = 12.5$ feet
width = 15 feet
area = $12.5 \times 15 = 187.5$ square feet

Side D: average height = $(4 + 10)/2 = 7$ feet
width = 20 feet
area = $7 \times 20 = 140$ square feet

For this example

<i>height category</i>	<i>area</i>
less than 6 feet	75 square feet
6 feet to 10 feet	140 square feet
10 feet to 20 feet	$210 + 188 = 398$ square feet
greater than 20 feet	N.A.

These numbers would be entered on Form 230-031 as follows:

Std. Item No.	Item Use	Item Description	Quant.	Unit of Meas.
4012	Std. Item	Shoring or Extra Excavation, Class A Dry: Average Overall Height	(Enter Total for Bridge Here)	L.S.
Pier	6 ft.	6 ft. to 10 ft.	10 ft.* to 20 ft.	20 ft. S.F.
Example	75	S.F. 140	S.F. 398 (11.5*) S.F.	S.F. — S.F.
		S.F.	S.F.	S.F. S.F.
		S.F.	S.F.	S.F. S.F.
		S.F.	S.F.	S.F. S.F.

* Indicate Average Height

12.2.7 Piling

The piling quantities are to be measured and paid for in accordance with Standard Specification Sections 6-05.4 and 6-05.5. Computation of piling quantities shall follow the same provisions.

Timber test piles are driven outside the structure limits and are extra or additional piling beyond the required number of production piling. See Standard Specification Section 6-05.3(10).

Concrete or steel test piles are driven within the structure limits and take the place of production piling. In this case, the quantities for number and length of production piling is reduced by the number and length of test piling.

The quantity for “Furnishing _____ Piling _____” is the linear measurement of production piling below cut-off to the “estimated” pile tip (not “minimum” tip) specified in the Geotechnical report. (Does not include test piles.)

The quantity for “Driving _____ Pile _____” is the number of production piling driven. (Does not include test piles.)

Pile tips are required if so specified in the Geotechnical report. The tips on the test piles are incidental to the test pile; therefore, the number of pile tips reported on the Bridge Quantities Form 230-031 should not include the number of pile tips required on the test piles.

12.3 Construction Costs

12.3.1 Introduction

The construction costs itemized in Appendix 12-A-3, 12-A-4, 12-A-5, and 12-A-6 are to aid the user in estimating the cost of bridge and structure projects. The costs are based on historical data maintained by the Bridge and Structures Office and retrieved from recent WSDOT Contracts.

Requests for cost estimates from WSDOT Region offices and other Local Agency offices should be submitted in writing (hard copy or e-mail) to the Bridge Projects Unit, and a written or e-mail response will be returned within a reasonable time based on the schedule needs of the requesting office. Scoping or prospectus type cost estimates, and other cost estimates based upon deck area cost history and other readily available geotechnical information and project parameters can be prepared relatively quickly. Estimates requiring input from the Bridge Design Unit, either for preparation of preliminary quantities or other preliminary structural analysis will take longer to prepare.

Telephone requests for cost estimates from WSDOT Region offices and other Local Agency shall be referred to the Bridge Projects Unit for response.

All cost estimates prepared by the Bridge and Structures Office should have the concurrence of the Bridge Projects Engineer.

12.3.2 Factors Affecting Costs

12.3.2.1 Type of Structure

Many factors, as outlined in BDM Section 2.2.3, must be considered in the selection of the type, size, and location of a bridge or wall.

Common structures with conventional details will be within the low end and mid-range of costs. Unique or complex structures will be within the high end.

12.3.2.2 Location of Project Site

Projects in remote areas or with difficult access will generally be within or above the high end of the cost range.

12.3.2.3 Size of Project Contract

Small projects tend to be within the high end of the cost range while large projects tend to be within the low end of the cost range.

12.3.2.4 Foundation Requirements

Foundation requirements greatly affect costs. Water crossings requiring pier construction within the waterway are generally very expensive. Scour requirements can push the costs even higher. The earlier foundation information can be made available the more accurate the cost estimate will be. The Bridge Projects Unit should be made aware of unusual foundation requirements or changes to foundation type as soon as possible for updating of the estimate.

12.3.2.5 Sequencing of Project

Projects with stage construction, detours, temporary construction, etc., will be more expensive.

12.3.3 Development of Cost Estimates

Estimates prepared by the Bridge and Structures Office shall include 10 percent mobilization but not sales tax, engineering, construction contingencies, or inflation.

12.3.3.1 Types

A. Prospectus and Project Summary Estimates

Conceptual cost estimates are prepared when little information about the project is available. Use the construction costs in Appendix A, assuming the worst case conditions, unless actual conditions are known. An example of a worst case condition is deep foundation substructure (pile supported footings or shaft foundations). In remote areas, or for small projects, use the high end of the cost range. Use mid-range costs for usual conditions.

To cover unforeseen project modifications, add a 20 percent estimate contingency to a prospectus estimate and a 10 percent estimate contingency to a project summary estimate. These contingencies can be adjusted depending on the preliminary information available.

B. Preliminary Design Estimates

Preliminary design estimates are prepared during the preliminary design stage when the type and size of bridge is known. Limited foundation information is sometimes available at this stage. The construction costs in Appendix A shall be used with an appropriate inflation factor, assuming the worst case conditions, unless foundation conditions are known, along with a minimum of 10 percent contingency to cover scope creep.

C. Estimate Updates During Design

During the design period, the designer should keep the Bridge Projects Unit informed of significant changes to the design that might affect the cost. Examples of significant changes are: deeper than expected footing and seals, use of deep foundations (shafts or piles) when none were previously expected, change of substructure types, and changes to superstructure. This is a critical element in the project budgeting process.

D. Contract Estimates

The contract estimate is prepared by the Bridge Projects Unit after the Plans and Final Quantities have been submitted to the Bridge Projects Unit for preparation of the final Bridge PS&E. The contract estimate is prepared using the quantities furnished by the Bridge Design Unit, unit bid prices from Appendix A, other historical data, and the judgment of the engineer preparing the estimate. Unique, one-of-a-kind projects require special consideration and should include an appropriate construction cost contingency.

12.3.3.2 Responsibilities

A. Bridge Projects Unit

The Bridge Projects Unit is responsible for preparing the prospectus, project summary, preliminary, and final contract estimates and updating the preliminary estimate as needed during the design phase of the project.

The Bridge Projects Unit assists the WSDOT Region offices and other outside Local Agency offices, such as counties and cities, to prepare prospectus and project summary estimates when requested in writing.

B. Designer

The designer is responsible for providing preliminary quantities and final quantities to the Bridge Projects Unit to aid in the updating of preliminary estimates and the preparation of contract estimates.

12.3.3.3 Documentation

Whenever a cost estimate is prepared by the Bridge and Structures Office for an outside office, a Cost Estimate Summary sheet (Form 230-040 and Appendix 12-B-1) shall be filled out by the Engineer preparing the estimate. The Cost Estimate Summary shall be maintained in the Job File. During the design stage, the summary sheet shall be maintained by the Bridge Design Unit. At a minimum, the Cost Estimate Summary should list the initial and all subsequent cost estimates for each Preliminary Plan distribution made. It is the design unit supervisor's responsibility to ensure the summary sheet is up to date when the job file is submitted to the Bridge Projects Unit for preparation of the Bridge PS&E.

12.3.3.4 Cost Data

A. General

The Bridge costs summarized in Appendix A represent common highway, railroad, and water crossings. Consult the Bridge Projects Unit for structures spanning across large rivers or canyons and other structures requiring high clearances or special design and construction features.

The square foot costs are useful in the conceptual and preliminary design stages when details or quantities are not available. The various factors affecting costs as outlined in BDM Section 12.3.2 must be considered in selecting the square foot cost for a particular project. As a general rule, projects including none or few of the high-cost factors will be close to the mid-range of the cost figures. Projects including many of the high-cost factors will be on the high side. The user must exercise good judgment to determine reasonable costs. During the preliminary stage, it is better to be on the prudently conservative side for budgeting purposes.

B. Deck or Wall Face Area

The area to be used for cost estimates based upon deck or wall face area shall be computed as follows:

Bridge Widenings and New Bridges

The deck area of bridges is based on the actual width of the new portion of the roadway slab constructed (measured to the outside edge of the roadway slab) times the length, measured from end of wingwall to end of wingwall, end of curtain wall to end of curtain wall, or back to back of pavement seat if there are no wingwalls or curtain

walls. Wingwalls are defined as walls without footings which are cast monolithically with the bridge abutment wall and may extend past the abutment footing. Curtain walls are defined as walls that are cast monolithically with the bridge abutment wall and footing and only extend to the edge of footing.

Bridge Rail Replacement

The bridge rail and curb removal is based on the total length of the rail and curb removed.

Bridge Lengths With Unequal Wingwalls

If a bridge has wingwalls or curtain walls of unequal length on opposite sides at a bridge end of wingwalls or curtain walls on one side of a pier only, the length used in computing the square foot area is the average length of the walls. If the wingwalls are not parallel to the centerline of the bridge, the measurement is taken from a projected line from the end of the wingwall normal to the centerline of the roadway.

Retaining Walls

If retaining walls (walls that are not monolithic with the abutment) extend from the end of the bridge, the cost of these walls is computed separately. The area of the wall is based on the overall length of the wall, and the height from the top of footing to the top of the wall.

12.4 Construction Specifications and Estimates

12.4.1 General

The Bridge Projects Unit prepares the specifications and estimates (S&E) for all structural projects designed or reviewed by the Bridge and Structures Office. The preparation includes distributing review sets, reviewing the job file, plans, PS&E check list, "Not Included in Bridge Quantities List," and Geotechnical report; preparing the cost estimates, specifications, and working day schedules; and submitting the PS&E package to the Region.

12.4.2 Definitions

A. Standard Specifications

The Standard Specifications for Road, Bridge and Municipal Construction is published biannually by the WSDOT Engineering Publications Office, is maintained by the WSDOT Construction Office, and is used as the governing construction specification for all WSDOT construction projects.

B. Amendments

Amendments are revisions to specific sections of the Standard Specifications, which are approved and enacted during the two year period that a specific edition of the Standard Specifications is in force. Amendments are published normally three times during a calendar year – April, August, and December.

C. Special Provisions

Special Provisions are supplemental specifications and modifications to the Standard Specifications, including Amendments, which apply to a specific project.

D. Addendum

A written or graphic document, issued to all bidders and identified as an addendum prior to bid opening, which modifies or supplements the bid documents and becomes a part of the contract.

E. AD Copy

The AD copy is the contract document advertised to prospective bidders. The AD Copy may include, but not be limited to, the following as component parts: Bid Proposal Form, Special Provisions, Amendments, Plans, and Appendices including test hole boring logs, and environmental permit conditions.

F. As defined in Standard Specification Section 1-02.4, the order of precedence of AD Copy components is as follows: Addenda, Bid Proposal Form, Special Provisions, Plans, Amendments, Standard Specifications, and Standard Plans.

12.4.3 General Bridge S&E Process

A. Typical Reviews and Milestone Dates

The Ad Date, as established by the Region, is the anchor for all project schedule dates.

The Bridge PS&E turn-in date is the date the Bridge PS&E package is due to the Region, and serves to note the beginning of the PS&E review period. Typically, the Bridge PS&E turn-in date is ten weeks prior to the scheduled Ad Date. When a longer PS&E review period is desired by the Region, the Bridge PS&E turn-in date can be as much as 12 to 14 weeks prior to the scheduled Ad Date.

The Bridge Plans turn-in date is the date the Bridge Plans are due to the Bridge Projects Unit from the Bridge Design Unit or Bridge Consultant assigned to the project, and serves to note the beginning of the Bridge S&E preparation period. Typically, the Bridge Plans turn-in date is four weeks prior to the scheduled Bridge PS&E turn-in date.

For some projects, the Region may schedule Constructability Reviews at times prior to the scheduled Bridge Plans turn-in date. These Constructability Reviews typically include plan sheets as developed to date, and in some cases may include draft Special Provisions. For most of the few projects with Constructability Reviews, the coordination of submittals and reviews will be through the specific Bridge Design Unit involved. However, if the Constructability Review requires Special Provisions, the Bridge Projects Unit should be included in the process.

For hydraulic, mechanical, and electrical rehabilitation projects for movable bridges, the Bridge Preservation Office takes a lead role in managing the design process for the project. These projects will typically include additional review periods similar to those described above for Constructability Reviews.

B. Bridge Plans Distribution

Once the Bridge Projects Unit receives the Bridge Plans from the Bridge Design Unit or Bridge Consultant assigned to the project, the Bridge Scheduling Engineer will assign the project to a specific Bridge Specifications and Estimates Engineer, and will create a Bridge PS&E file for the project.

The Bridge Specifications and Estimates Engineer will distribute the Bridge Plans, along with a Not Included in Bridge Quantities List, under a cover letter addressed to the Region Design Project Engineer (Olympic and Northwest Regions) or Region Project Development Engineer (all other Regions). The distribution list also includes the FHWA Washington Division Bridge Engineer, WSDOT Bridge Construction Engineer, and the Region Project Development and Region Plans Engineer (except for Olympic Region).

For new bridges and bridge widenings, internal Bridge and Structures Office distribution includes the Bridge Design Engineer, Bridge Projects Engineer, and the Bridge Design Unit Supervisor. The Bridge Plans may be distributed to other offices such as the Materials Laboratory Geotechnical Services Branch and the Bridge Preservation Office depending on the scope of the project and the value of the added review.

The Bridge Plan distribution will specify a due date for the return of review comments to the Bridge Specifications and Estimates Engineer. This date is typically one week prior to the scheduled Bridge PS&E turn-in date, but can be modified to suit project specific schedule considerations.

C. Bridge PS&E Development

Following the distribution of the Bridge Plans, the Bridge Specifications and Estimates Engineer will review the Bridge Plans, develop the Bridge Special Provisions and Bridge Cost Estimate, and prepare the bridge working day schedule. See BDM Sections 12.4.4, 12.4.5, 12.4.6, and 12.4.7.

D. Bridge PS&E Distribution

At the completion of the Bridge PS&E package, or at the scheduled Bridge PS&E turn-in date, whichever comes first, the Bridge Specifications and Estimates Engineer will distribute the Bridge PS&E. The Bridge PS&E package should include the items specified in BDM Section 12.4.9 A, and should be distributed to those identified in BDM Section 12.4.9 B.

12.4.4 Reviewing Bridge Plans

The Bridge Specifications and Estimates Engineer performs the following tasks after receiving the Bridge Plans submittal:

A. Job File

Review correspondence and e-mails in the job file for the items of work and other commitments which need to be included in the Bridge PS&E. Identify items that need special provisions and bid item references. Identify items that require additional research by, and information from, the bridge designer, Region designers, or others. Confirm that the job file fly leaf information has been completed by the designer (Form 221-076).

B. PS&E Check List (Form 230-037)

Review the form as completed by the bridge designer for identified needs for special materials, construction requirements, permits, etc., which may need Special Provisions such as:

- Permits: United States Coast Guard
- Agreements: utilities on bridge, etc.
- Materials: high strength structural steel, high-strength concrete, polyester and polymer concrete, carbon fiber wrap, high-load elastomeric bearing pads and other high capacity bridge bearings, etc.
- Construction Requirements: temporary access, stage construction, construction over railroad, special welding and welding inspection requirements, and other special construction requirements
- Special Items: modified concrete overlay or special architectural, paint, and sealer treatments

- Proprietary Materials: identification of, and justification for use of, products and materials which are specified in the Bridge Plans by specific manufacturer and model, instead of generic manufacture
- C. Summary of Quantities (Form 230-031 and Appendix 12-A-2)
- Verify that the Summary of Quantities is labeled as “Supervisor’s Bridge Quantities.” See BDM Section 12.2.2. Quantities listed in this form are used to develop the Bridge Cost Estimate for the project.
- D. Plans
- Review the plans for consistency with the special needs identified by the bridge designer in the PS&E check list form (subsection B above), use of standard notes and General Notes, completeness of title block information, and use of terminology consistent with the Standard Specifications, Standard Plans, and Standard Bid Items.
- E. Not Included in Bridge Quantities List (Form 230-038 and Figure 12-A-1)
- Review the form completed by the bridge designer and compare with the Bridge Plans for items shown in the Bridge Plans that may be missing from the list. See BDM Section 12.1.2.
- F. Geotechnical Report
- Review the Geotechnical Report for the project to confirm that the foundation types, sizes, and elevations shown in the Bridge Plans are consistent with the recommendations specified in the Geotechnical Report. Obtain a copy of the final Geotechnical Report for the S&E file. Review the Geotechnical Report for construction consideration requirements which may need to be noted in the Special Provisions, such as shaft casing requirements, bridge embankment settlement periods, special excavation, etc. Compare the number of test holes and the locations shown in the layout sheets for all bridges against number and locations of test holes identified in the final Geotechnical Report.

12.4.5 Preparing the Bridge Cost Estimates

- A. General
- From the quantities shown in the Summary of Quantities form submitted with the Bridge Plans, the Bridge Specifications and Cost Estimates Engineer develops the Bridge Cost Estimate for the project. The Bridge Projects Unit uses a standard spreadsheet format for Cost Estimates. This spreadsheet includes the tabulation of all bridge bid items, a breakdown for each lump sum item, and square foot cost of the structure.
- B. Procedure
- Each quantity shown in the Summary of Quantities form is to be matched with an appropriate unit bid item or lump sum bid item. These can be Standard Bid Items from the Standard Bid Item Table, or project specific non-standard bid items.
- Pricing for the bid items above can be based on the Construction Cost Estimating Aids listed in Appendix 12-A-3, 12-A-4, 12-A-5, and 12-A-6, bid tabulations from previous contracts, and the Unit Bid Analysis and Standard Item Table listing available through the WSDOT Contract Ad & Award Office web site. The Bridge Specifications and Estimates Engineer uses appropriate engineering judgment to make appropriate adjustments for inflation, site location, quantities involved, total of the work involved, etc.

All Standard Bid Items listed in the spreadsheet shall include the Standard Bid Item number assigned to that bid item. All non-standard bid items shall be identified by the appropriate pre-qualification code for the bid item work. The pre-qualification codes specified in the Standard Item Table should be reviewed to help establish the appropriate code for non-standard bid items. When in doubt, the general Bridge and Structures pre-qualification code of (B0) should be used.

All bridge cost estimates shall include mobilization, but do not include sales tax, engineering, contingencies or inflation.

12.4.6 Preparing the Bridge Specifications

A. General

There are three categories of Special Provisions:

1. General Special Provisions (GSP's) are supplemental specifications which are standardized and approved for Statewide use by the WSDOT Construction Office. The library of GSP's is maintained by the WSDOT Design Office. GSP's are formatted to supplement specific Standard Specification Sections. GSP's are identified by their publication and effective date in parenthesis immediately preceding the GSP text. GSP's are published normally three times during a calendar year – April, August, and December.
2. Bridge Special Provisions (BSP's) are supplemental specifications which are standardized and approved for Statewide use by the WSDOT Bridge and Structures Office. The library of BSP's is maintained by WSDOT Bridge and Structures Office through the WSDOT Design Office. BSP's are formatted to supplement specific Standard Specification Sections. BSP's are identified by the acronym "BSP" followed by their publication and effective date in parenthesis immediately preceding the BSP text. BSP's are published periodically throughout the year.
3. Project Specific Special Provisions include all supplemental specifications which are not GSP's nor BSP's. Project Specific Special Provisions, as the name implies, are intended for project specific use, whether one time or infrequent. The vast majority of Project Specific Special Provisions are formatted to supplement specific Standard Specification Sections. However, in rare cases, they can be formatted as "stand-alone" following the "**Description / Materials / Construction Requirements / Measurement / Payment**" format. Project Specific Special Provisions are identified by six asterisks in parenthesis immediately preceding the text or heading. A Project Specific Special Provision that sees frequent use can be standardized and elevated to BSP or GSP status.

B. Procedure

Based on review of the Bridge Plans and the PS&E Check List, the Bridge Specifications and Estimates Engineer determines the items of work which are not already covered by the Standard Specifications and for which supplemental specifications are needed. Based on this determination, and review of the current list of Amendments, GSP's, and BSP's, a Bridge Special Provision runlist is prepared, listing the code numbers of the applicable Amendment, GSP, and BSP documents needed for the project. Current Amendment, GSP, and BSP documents are listed in the WSDOT Design Office Project Development web site.

These documents are listed following the Section order of the Standard Specifications, Amendments first, followed by the Special Provisions. Fill-in blanks for BSP's and GSP's requiring project specific information can be completed at this time.

When the Standard Specifications, Amendments, GSP's and BSP's are insufficient to cover project specific requirements, Project Specific Special Provisions are developed, and added by name at the appropriate location in the runlist.

See Division 6 of the WSDOT Plans Preparation Manual for further discussion and example flow charts.

When the Bridge Special Provision file is complete with all Special Provisions needed to accompany the Bridge Plans, the Bridge Specifications and Estimates Engineer requests a single space document of the Bridge Special Provision file for use in the Bridge PS&E distribution.

12.4.7 Preparing the Bridge Working Day Schedule

A. General

The Bridge Specifications and Estimates Engineer calculates the number of the working days necessary to construct the bridge portion of the contract, based on the quantities shown in the Summary of Quantities form submitted with the Bridge Plans, and enters the time in the special provision "Time for Completion." The working days are defined in the Section 1-08.5 of the Standard Specifications.

B. Procedure

The first task of estimating the number of working days is to list all the construction activities involved in the project. These include all actual construction activities such as excavation, forming, concrete placement, and curing; and the nonconstruction activities such as mobilization, material and shop plan approval. Special conditions such as staging, limited access near wetlands, limited construction windows for work in rivers and streams, limited working hours due to traffic and noise restrictions, require additional time.

The second task is to assign the number of working days to each construction activity above (see Figure 12-B-2). The "Construction Time Rate" table can be used as a guide to estimate construction time required. This table shows the average rate of output for a single shift, work day only. Adjustment to the rates of this table should be made based on project size, type of work involved, location of the project, etc. In general, larger project will have higher production rates than smaller projects, new construction will have higher production rates than widening, and unstaged work will have higher production rates than stages work.

The last step is to arrange construction activities, with corresponding working days, into a construction schedule on a bar chart, either by hand on the Construction Working Day Schedule Form 230-041 (see Appendix 12-B-2) or by computer using a scheduling program. List the activities in a logical construction sequence, starting from the substructure to the superstructure. Items shall overlap where practical and the critical path shall be identified.

12.4.8 Reviewing Projects Prepared by Consultants

A. General

Consultants preparing Bridge Plans are required to submit their 90 percent complete design package to the Bridge and Structures Office on or before the scheduled Bridge Plan turn-in date, and with all associated information (files, forms, lists, and reports), as specified in BDM Sections 12.4.3 and 12.4.4.

The package shall be in the same format as those prepared by the Bridge and Structures Office.

B. Procedure

The Bridge Specifications and Estimates Engineer reviews the consultant's Bridge Plans following the process as specified in BDM Sections 12.4.3 and 12.4.4. The review comments of the Bridge Specifications and Estimates Engineer should be combined with review comments from the Bridge Design Unit assigned to review the project, and returned to the consultant in a timely manner through the Bridge Consultant Liaison Engineer, allowing the consultant to meet the scheduled turn-in date for the Bridge PS&E. After the consultant addresses all review comments and resubmits the package as 100 percent complete, the Bridge Specifications and Estimates Engineer compiles the Bridge PS&E package (See BDM Section 12.4.9).

Except for hydraulic, mechanical, and electrical rehabilitation projects for movable bridges, and other unique bridge projects where specifically approved by the Bridge Projects Engineer, all Bridge Special Provisions shall be prepared by the Bridge Projects Unit. The Bridge Cost Estimate and working day schedule should be prepared by the Bridge Specifications and Estimates Engineer with assistance from the consultant as appropriate.

12.4.9 Submitting the PS&E Package

A. General

The PS&E package includes:

1. Cover transmittal memo to the Bridge Design Engineer (for new bridges and bridge widenings only)
2. Cover letter to the Region.
3. Bridge Construction Cost Estimate for each separate structure
4. Cost Estimate Summary for each separate structure (see Appendix 12-B-1)
5. Not Included in Bridge Quantity List
6. Construction Working Day Schedule
7. Single space document of Bridge Special Provision file with runlist
8. Log of Test Borings
9. One Plan Set (11" by 17")

B. Procedure

The cover memorandum should be addressed to either the Region Plans Engineer (all Regions except for Olympic Region) or the Region Design Project Engineer (Olympic Region only). Others that should be included as cc's in the distribution are as follows:

1. FHWA Washington Division Bridge Engineer.
2. Region Design Project Engineer (except for Olympic Region – already addressed above).
3. Region Construction Project Engineer (if known and if different from the Region Design Project Engineer).
4. Northwest Region Area Engineering Manager (Northwest Region only).
5. Region Project Development Engineer (Eastern, North Central, South Central, and Southwest Regions only).
5. Bridge Construction Engineer.

6. Materials Laboratory.
7. Bridge Preservation Office.
8. Bridge Management Engineer (for all Bridge Replacement, Seismic Retrofit, and Bridge Repair projects).
9. All Bridge Design Unit Supervisors whose units contributed Bridge Plans to the project.
10. All bridge consultants who contributed Bridge Plans to the project.
11. Bridge Consultant Liaison Engineer (when bridge consultants contribute Bridge Plans to the project).

Modifications to the distribution list should be made by the Bridge Specifications and Estimates Engineer based on Region involved, and project specific requirements.

12.4.10 PS&E Review Period and Turn-in for AD Copy

A. Description

The PS&E Review Period between Bridge PS&E turn-in and Ad Date is used to allow the Region to compile PS&E from their Design PE Office and all support groups into a Review PS&E set that can be distributed to all interested parties for review and comment. The process ensures that all parts of the PS&E are compatible, complete, and constructable.

B. Procedure

Each Region has its own specific process, but the general procedure is similar. The Bridge and Structures Office review set is addressed to the Bridge Projects Engineer. This occurs shortly after the Bridge PS&E turn-in date. Upon receipt in the Bridge and Structures Office, the Review PS&E set is delivered to the Bridge Specifications and Estimates Engineer assigned to the project. The review is to be performed, and comments returned to the Region, by the due date specified in the distribution letter. Review comments should be returned to both the Region Plan Reviewer and the Region Design PE contact assigned to the project, as identified in the distribution letter.

Depending on the scope of the project, and the Region responsible for the project, there may be a meeting to discuss review comments. If such a meeting is held (generally about halfway through the PS&E review period), the Bridge Specifications and Estimates Engineer and others from the Bridge Design Unit responsible for the project, should consider attending if discussion of Bridge PS&E review comments is likely.

Shortly after the specified due date for review comments passes, Region comments on the Bridge PS&E should be received by the Bridge Specifications and Estimates Engineer and/or the bridge designer(s) in the Bridge Design Unit. These review comments on the Bridge PS&E should be addressed before the final Bridge PS&E is turned-in for AD Copy printing. The Bridge Specifications and Estimates Engineer makes all necessary revisions to the Bridge Cost Estimate and Bridge Special Provisions, and notifies the appropriate contacts in the Region Design PE Office and the Region Plans Office when these changes are complete. This should be completed at least two weeks prior to the scheduled Ad Date.

After the Bridge Design Unit has completed all necessary revisions to the Bridge Plans, the Bridge Plans are signed and dated in blue ink by the appropriate engineers, and the signed originals turned in to the Bridge Specifications Engineer. Copies of these signed plans are sent to the Region for use in the AD Copy PS&E. This should be completed one to two weeks prior to the scheduled Ad Date. The original signed plans are forwarded to the Bridge Plans Engineer in the Bridge Projects Unit.